MASS. HS30.200: T69
UMASS/AMHERST
312066 0282 3964 7
892/363

Traumatic Occupational Fatalities in Massachusetts November 1986 - October 1987

GOVERNMENT DOCUMENTS
COLLECTION

AUG 10 1989

University of Massachusetts
Depository Copy

Bureau of Health Statistics, Research and Evaluation
Massachusetts Department of Public Health

April 1989

892/23

The Commonwealth of Massachusetts
Executive Office of Human Services
Department of Public Health

Michael S. Dukakis, Governor
Philip S. Johnston, Secretary, Executive Office of Human Services
Deborah Prothrow-Stith, M.D., Commissioner, Department of Public Health
Howard Spivak, M.D., Deputy Commissioner, Department of Public Health

TRAUMATIC OCCUPATIONAL FATALITIES IN MASSACHUSETTS

November, 1986 – October, 1987

Bureau of Health Statistics, Research and Evaluation
Daniel J. Friedman, Ph.D., Assistant Commissioner
Research and Epidemiology Unit
Bruce B. Cohen, Ph.D., Director
Occupational Health Surveillance Program
Letitia Davis, Sc.D., Director

Massachusetts Department of Public Health
150 Tremont Street
Boston, Massachusetts 02111

March 1989

Investigation carried out under the direction of the
Massachusetts Interagency Task Force on Occupational Illness
and Injury Surveillance and Intervention

ACKNOWLEDGEMENTS

This study was carried out by Chee Khoon Chan, S.M. and Letitia Davis, Sc.D. under the direction of the Massachusetts Interagency Task Force on Occupational Illness and Injury Surveillance and Intervention. It is the result of the joint efforts of several state agencies and the Region 1 office of the Occupational Safety and Health Administration. The authors would like to thank the following individuals in these agencies for their assistance in providing the data for this study and for their advice: Joseph Belloli, Acting Director, Division of Industrial Safety, Department of Labor and Industries; Ronald S. Ratney, Assistant Regional Administrator, Occupational Health and Safety Administration, Region 1; William F. Russell, Director, Office of Safety, Department of Industrial Accidents; and Elaine Trudeau, Registrar of Vital Records, Department of Public Health.

In addition, we would like to thank Nancy Fox and Cathy Schwartz for their invaluable input and Gregory Hanna for his assistance in the production of the final report.

This study was supported in part by funds provided by the National Institute for Occupational Safety and Health through a Cooperative Agreement with the Massachusetts Department of Public Health.

Digitized by the Internet Archive
in 2014

https://archive.org/details/traumaticoccupat00mass

INTRODUCTION

Traumatic occupational deaths are not random events. They occur in predictable patterns - in predictable occupations, industries and circumstances. Because work-related deaths are predictable, they are largely preventable. Yet fatal occupational injuries continue to occur daily in the United States. Estimates of the number of deaths each year vary widely ranging from 3,750 in 1984 reported by the Bureau of Labor Statistics to 11,300 reported for the same year by the National Safety Council.[1,2] The National Institute for Occupational Safety and Health estimates, on the basis of death certificate data, that approximately 7,000 work-related traumatic deaths occurred each year from 1980-1985.[3]

In Massachusetts there is no comprehensive system for the routine identification of traumatic occupational fatalities. Estimates of the number of fatal occupational injuries which occur in Massachusetts each year have ranged from approximately 60 to over 250.[3,4] As shown in Table 1, there are several different sources of occupational fatality information maintained by both state and federal agencies, but these data have never been centralized. Employers are required to report fatal occupational injuries to the Massachusetts Department of Industrial Accidents (DIA) and to the Federal Occupational Health and Safety Administration (OSHA), but compliance with reporting requirements has not been evaluated.[5,6]

In 1987, the Massachusetts Interagency Task Force on Occupational Illness and Injury Surveillance initiated a study of traumatic occupational fatalities in Massachusetts, combining data from death certificates, workers' compensation records, OSHA fatality reports and fatality reports received by the Department of Labor and Industries (DL&I). The purpose of the study was threefold:

1) to provide a comprehensive profile of traumatic occupational fatalities which occurred in Massachusetts from November, 1986 through October, 1987;

2) to assess the adequacy of existing state and federal information sources which identify traumatic occupational fatalities and hence, the usefulness of these sources for routine surveillance; and

3) to evaluate compliance with current regulations requiring employers to report fatal

occupational injuries to OSHA and the DIA.

This study is part of an on-going effort in Massachusetts to evaluate the quality of occupational health data and to develop a comprehensive occupational health surveillance system.

Work-related deaths are not limited to traumatic occupational fatalities but include deaths due to occupational diseases such as the pneumoconioses and occupational cancers as well as cardiovascular deaths precipitated by workplace factors. The relationship between workplace factors and these chronic disease deaths, however, is much more difficult to establish, and there is no readily available source of information about the number or distribution of work-related chronic disease deaths in the Commonwealth. While recognized as critical public health problems which demand further investigation, these deaths are beyond the scope of the present report.

METHODS

Case Definition

For purposes of this study, traumatic occupational fatalities were defined as deaths resulting from traumatic injuries or other external causes which occurred while at work, whether employed by others or self-employed, excluding suicides. This definition encompasses deaths due to acute over exposure to toxic chemicals, homicides and motor vehicle accidents suffered while travelling on the job or between job assignments. It excludes deaths due to motor vehicle accidents which occurred while travelling between home and work.

The study period was defined as November 1, 1986 - October 31, 1987, the first twelve month period for which computerized workers' compensation data was available. Eligible cases included all traumatic occupational fatalities, 16 years or older, both resident and non-resident, where the fatal incident occurred in Massachusetts and the individual died in Massachusetts during the study period. The study population was limited to those 16 years or older for purposes of comparability with national findings.

Case Ascertainment

The following records were obtained in order to identify the cases:

- All Massachusetts death certificates with date of death falling within the study period on which the item "Injury at Work" was checked yes.
- All reports of work-related fatalities occurring within the study period filed with the Department of Industrial Accidents, as of July 1, 1988. These records include First Reports of Injury filed by employers, as well as claims filed by workers, and payment or denial of payment forms filed by insurers, which may or may not be accompanied by prior employer reports of injury.
- All reports of work related fatalities occurring within the study period received by the Department of Labor and Industries as of July 1, 1988 and maintained in their occupational fatality file.
- All reports of fatal injuries occurring within the study period reported to the Region I, the New England Region, OSHA Office and recorded in their computerized OSHA 1 and/or OSHA 36 files.

Data items obtained from each information source are listed in Appendix A.

The records were merged using available personal and employer identifiers as well as incident data and injury descriptors. On the basis of the information contained in the records, coupled with cause of death information on death certificates, fatalities which did not meet the case definition outlined above were excluded from the analysis. In several cases where the time of day or nature of injury coupled with employment information raised questions about the work-relatedness of the death, additional information was sought from medical examiners, funeral directors, police departments and employers to verify that the fatal event had occurred while working.

For those eligible cases which were identified through sources other than death certificates, additional information was obtained from death records and incorporated into the data base.[1]

Information on cause of death, age, sex, race, time of event, and time interval between

---

[1] Death certificates could not be located for two of the eligible cases: a plane crash victim whose body was presumably not recovered, and a female cashier struck by a falling object.

injury and death used in the analysis was obtained from death certificates. Available industry and occupation information was coded according to the Bureau of Census classification system by coders trained at the National Institute for Occupational Safety and Health (NIOSH).[7] Where there were discrepancies In industry and occupation information contained in the different records for any one case, the general rule was to accept the Information provided in DIA or DL&I records.

Fatality Rates

Traumatic occupational fatality rates were computed as the number of traumatic occupational fatalities per full-time-equivalent Massachusetts workers x 100,000. For computation of age, Industry and sector specific rates, denominator data was obtained from the Massachusetts Department of Employment Security (1987 statistics). Fatality rates by race, sex and occupation were generated using denominator data from the Bureau of Labor Statistics Geographic Profile of employment for 1987.[8]

Rates were not computed for groups with less than 5 observed deaths.

Employer Compliance with Reporting Regulations

To assess employer compliance with mandatory reporting requirements, fatalities were reviewed on a case by case basis to determine if they were legally reportable to OSHA and/or the DIA. Deaths were considered reportable to OSHA if the identified employer and/or industry was a private sector employer/industry covered by the Occupational Health and Safety Act. Homicides, motor vehicle traffic and airplane crash fatalities were not included in this category. While these deaths are technically reportable to OSHA, in practice, they are investigated by other agencies. If reported to the OSHA Region I office, they are not recorded on OSHA Catastrophe Report forms (Form 36) which are used to log in fatality reports.

A death was defined as reported to OSHA if an OSHA Catastrophe Report form had been completed for the case. These forms are filled out by OSHA regardless of who files the report.[9] Often this will be someone other than the employer or employer representative, such as a police officer or emergency medical technician (Personal communication: R. Ratney). It was not possible, on the basis of the available information, to distinguish reports filed by employers from those filed by others. Counting all "OSHA 36 cases" as reported, therefore, overestimates actual

compliance by employers with fatality reporting requirements.

A fatality was considered reportable to DIA if the identified employer and/or industry came under the jurisdiction of the Massachusetts Workers' Compensation Act. For purposes of the present investigation, cases working for out-of-state employers were not considered reportable to the DIA. Fatalities were defined as having been reported to the DIA only if a First Report of Injury had been filed with the Department by the employer.

RESULTS

Demographic and Employment Characteristics

A total of 86 eligible traumatic occupational fatalities were identified using the four data sources combined. The overall fatality rate was 2.9 per 100,000 Massachusetts workers. (A complete list of all identified fatalities both eligible and ineligible is included in Appendix B.)

As shown In Table 2, the workers who died were predominantly male. Specifically, there were 82 male deaths and 4 female. The four female workers included: 2 workers killed by motor vehicles, 1 painter who fell on the job, and a cashier who was struck by a falling piece of audio equipment. The workers ranged in age from 16 to 68 years with a median of 36 years. The bulk of fatal injuries occurred among workers 20-54 years old. The age group with the highest fatality rate, however, was the 55-64 years old group. There was only 1 decedent 65 years old or older. It is notable that there were four deaths among teenagers.[2]

Fatality rates by race are also presented in Table 2. The rate for Black workers was almost double that of the White working population. This rate is based on small numbers and should be interpreted with caution.

The distribution of fatalities by place of occurrence is shown in Table 3. Approximately 12% of the fatal events occurred at construction sites, 29.1% on roadways and sidewalks, 15.1% in industrial buildings and premises and 19.8% in other commercial buildings and premises.

Fatalities occurred most frequently between 9 a.m. and 5 p.m., i.e., the more usual working

---

[2] One worker less than 16 years old was killed during the study period. This case involved a 13 year old pedestrian delivery boy who was struck by a motor vehicle.

hours. (Table 4) These are not necessarily the most hazardous worktimes, which cannot be determined without additional information on the distribution of work-hours. The great majority of the deaths (72 deaths, 83.7%) occurred on weekdays.

As shown in Table 5, 68 of 79 (86%) of the deaths with known time interval between injury and death occurred within 24 hours of injury. Four out of five cases died within 4 hours. Only 2 of the identified deaths occurred later than 30 days after the event, raising the possibility that some delayed deaths are not captured by any of the four information sources used in this investigation.

As shown in Table 6, the leading cause of death was motor vehicle traffic accidents (22.1%), followed by electrocutions (18.6%), falls (15.1 %) and machinery (11.6%). Homicides, all male, accounted for 3.5% (3) of the deaths. These included: one policeman, one bartender and one liquor store clerk, all of whom were shot on the job.

The frequency and rates of traumatic occupational fatalities according to industry are shown in Table 7. The construction industry had both the highest number of deaths and the highest rate (n=27, rate = 17.8 per 100,000). The leading causes of death among construction workers were falls (8 deaths), electrocutions (6 deaths) and falling objects (3 deaths).

The second highest rate was for the Transportation, Communications and Utility Industry (N = 13, rate = 7.8 per 100,000). Six of the 13 deaths in this industry group involved motor vehicles; 5 of these 6 were truck drivers. The fatality rate for the retail trade industry (2.0 per 100,000) was similar to that for manufacturing (1.8 per 100,000.) Two of the 11 deaths in retail trade were homicides.

The frequency and rates of fatalities by occupation are shown in Table 8. The transportation and material moving occupations had the highest rate of traumatic occupational fatalities (18.0 per 100,000). Approximately 70% of these deaths were due to motor vehicles. High rates were also observed among craftsmen and laborers, most of whom worked in the construction industry. Technicians and related support occupations also had a higher than average rate (6.1 per 100,000). In this group, four of the seven cases were pilots who died in plane crashes.

Tables presenting cause of death by industry and by occupation are included in Appendix

C.

Approximately 10% (9) of all workers killed were public employees. The fatality rate for public sector workers (2.4 per 100,000) was comparable to that for workers in the private sector (2.9 per 100,000) (Table 9).

Case Ascertainment by Information Source

The number and percent of the 86 traumatic occupational fatalities captured by the four information sources are shown in Table 10.[3] Of the total number of identified fatalities, 88.4% were captured by death certificates. Case ascertainment was low, less than 66% for each of the remaining three sources. Correspondingly, 24 fatalities were captured by death certificates only and no other source. All deaths identified by OSHA were identified by at least one other source. Death certificates and DIA records combined captured 84 or 97.6% of all the identified deaths.

As shown in Table 11, death certificates captured all electrocutions, all falls, all deaths caused by machinery and 73.6% or 14 of 19 identified motor vehicle traffic accident deaths. Thus five of the ten deaths not identified as work related by medical examiners involved on-the-road motor vehicles.[4]

Case ascertainment by industry and information source is presented in Table 12. Although the numbers in the cells of this table are sparse, they reveal some interesting patterns. Death certificates captured a fairly high proportion of fatalities in all industries with the exception of agriculture in which there were only 3 deaths. DIA captured all 11 deaths in the manufacturing and agricultural industries. Otherwise, capture was only partial, most notably for deaths in the construction, service and retail industries. DL&I records, which were based on voluntary reporting during the study period, were uniformly poor at capturing fatalities. Those which were

---

[3] In the initial computer search by DIA, only 27 cases were identified. Subsequently, a manual search for those cases identified by other sources revealed an additional 26 cases in DIA files. These had not been captured in the initial search because of missing information or data transcription errors and difficulties associated with a newly computerized system. The additional cases were incorporated into the analysis.

[4] The remaining five deaths not captured on death certificates include: a custodian asphyxiated in a burning building, a self-employed contractor crushed while servicing a truck, an electrical lineman who collapsed on the job, and the 2 deaths for which certificates could not be located.

identified by DL&I tended to be in those industries with which the Department has traditionally been involved, namely construction and manufacturing. Likewise, OSHA records identified 9 out of 11 (81.8%) manufacturing fatalities and 17 out of 27 (62.9%) of construction deaths but less than 35% of the deaths in any of the other industries.

As shown in Table 13, the patterns of case ascertainment by occupation and information source are consistent with the industry-specific findings. Death certificates perform uniformly well; the other information sources tend to capture deaths in the construction and manufacturing occupations, namely production and craft workers and machine operators, but fail to identify fatalities in the transportation, sales and service occupations.

Employer Compliance with Occupational Fatality reporting Laws

Case ascertainment using OSHA and DIA records is quite poor, raising the possibility of extensive under-reporting by employers to these agencies. However, not all Massachusetts employers are under OSHA jurisdiction or are covered under the Massachusetts Workers' Compensation Act. To evaluate compliance with legally mandated reporting requirements, it is necessary to consider reportable deaths only.

OSHA: Of the 86 fatalities, 51 were found to be reportable to OSHA. Five of the cases were of uncertain reporting status; the remainder included motor vehicle and plane related fatalities, homicides, self-employed cases and public sector workers.

As shown in Table 14, 35 of the 51 (68.6%) reportable cases were actually reported to OSHA. As stated previously, not all of these cases were necessarily reported by employers, thus these figures likely overestimate actual employer compliance. Of the 16 cases which were not reported, three were off-the-road vehicular fatalities occurring on work premises or in parking bays, and two appeared to involve workers in incorporated family businesses. There was one case of a worker who died as a result of complications arising from a fall 11 months earlier. The remaining 10 fatalities appeared to be quite clearly reportable. The distribution of reportable fatalities actually reported are presented by industry in Table 15. All deaths in manufacturing and the transportation, communications and public utilities industries were reported to OSHA. In contrast, OSHA was notified about less than half of the deaths in the service (2 of 6 deaths) and

retail (2 of 7 deaths) industries. Only 17 of 22 reportable construction deaths were reported to OSHA.

DIA: Of the 86 fatalities, 58 were considered to be reportable to DIA; there was insufficient information to determine the reporting status of an additional 11 cases. The remainder Included cases working for out-of-state employers, the self-employed, one firefighter, one policeman and one individual in the military.

First Reports of Injury were filed by employers for 26 (44.8%) of the 58 cases. Compliance ranged from 30% for electrocutions to 66.6% for motor vehicle-related deaths. Among industries, compliance was below 50% in every sector with the exception of manufacturing (Table 15). It was especially low for fatalities among general laborers (1 of 7) (Table 16).

If fatalities among individuals working for out-of-state employers had been included as reportable cases, compliance would have been even lower.

DISCUSSION

Traumatic occupational facilities in Massachusetts

Traumatic occupational fatalities are a continuing public health problem in Massachusetts as they are in other states. The present analysis revealed 86 deaths - an average of 1.7 traumatic occupational fatalities per week - during the 12 month study period. This figure is believed to underestimate the true number of fatal occupational injuries because it is likely that some on-the-job motor vehicle deaths and delayed deaths due to earlier workplace injuries have not been identified.

Using a standard public health measure, the difference between the age at death and age of life expectancy, the 86 observed deaths accounted for over 3,000 years of life lost. Four of these deaths were among teenagers. This underscores a previous finding that 24% of the adolescent injuries treated in Massachusetts emergency rooms were attributed to workplace accidents.[10]

The rate for Black workers was almost double that for Whites. This rate is based on small numbers and must be interpreted with caution. A higher rate for Blacks, however, is consistent

with previous reports and with the finding that minority workers are disproportionately concentrated in the most dangerous jobs or jobs with least access to health and safety training.[3, 11,12] This highlights the need for health and safety training targeted for and accessible to minority workers.

Fatalities among construction workers and electrocutions stand out as priorities for intervention and prevention in Massachusetts. Statewide employment in the construction industry has more than doubled between 1980 and 1987, and this trend is likely to continue as major public work projects get underway in 1989. New rules and regulations for the prevention of accidents in construction operations were issued by the DL&I in 1989.[13] This is an important step but will be effective only insofar as educational and enforcement activities take place. Electrocutions occur in a wide variety of workplaces and prevention will necessarily involve broad-based efforts.

The large number of work-related motor vehicle traffic fatalities raises policy issues yet to be addressed by both state and federal occupational health and safety agencies. Employer safety practices are potential factors in a number of these fatalities which suggests that occupational health and safety agencies should be more actively involved in the development and enforcement of standards for the protection of vehicle occupants.

Comparison of the Massachusetts and National Rates

The NIOSH National Traumatic Occupational Fatality (NTOF) surveillance system, which is based on death certificate data only and includes on-the-job suicides, reports an annual traumatic occupational fatality rate of 2.4 per 100,000 Massachusetts workers, which is substantially lower than the national rate of 7.9 per 100,000.[3] The overall rate of 2.9 per 100,000 workers observed in the present analysis is not strictly comparable with the NTOF findings but is generally consistent. Massachusetts does appear to have a relatively low rate of traumatic occupational fatalities compared to the rest of the country. This is not explained by the systematic failure of Massachusetts medical examiners, in contrast to certifiers in other states, to check the "injury at work" box on death certificates thus leading to comparative underestimates. The proportion of traumatic occupational deaths captured on death certificates in the present

investigation (88.4%) is similar if not higher than findings in other states. [14,15]

There are several factors which likely account for a low overall traumatic occupational fatality rate In Massachusetts. First is the composition of industry In the state. Proportionally, there Is very little mining and agriculture/forestry, both of which are very high risk industrial sectors. In contrast to many other states, much of Massachusetts manufacturing, most notably hI-tech Is relatively light.

Deaths involving motor vehicles account for a large proportion of occupational fatalities nationwide, thus a second explanatory factor is the relatively low motor vehicle death rate in Massachusetts. According to the Fatal Accident Reporting System (FARS), in 1987 the Massachusetts motor vehicle fatality rate per vehicle miles travelled was 33% lower than the national rate.[16] This difference is of the same order as the difference between NTOF national and present Massachusetts rates for the transportation and material moving occupations (national rate of 23.6 per 100,000 vs. Massachusetts rate of 17.0 per 100,000.) The markedly lower rate for the transportation occupations in Massachusetts likely reflects the lower overall state rate of motor vehicle fatalities.

Finally, the age-adjusted homicide rate for Massachusetts residents is also relatively low; in 1985 it was 3.7 per 100,000 residents, less than half the national rate of 8.1 per 100,000 for the same year.[17] Correspondingly, only 3 of the 86 traumatic occupational fatalities in Massachusetts were homicides. This contracts with the 1980-1985 NTOF data, in which homicides accounted for 13% of all traumatic occupational fatalities and 42% of all female deaths.[3]

Occupational Fatality Surveillance

Timely, accurate and complete information about fatal occupational injuries and deaths is necessary to design, and target effective prevention programs. A comprehensive occupational fatality surveillance system should accomplish two objectives:

—it should rapidly Identify traumatic occupatlonal fatalities to enable immediate and thorough worksite investigations; and

—it should provide summary "statistical" data necessary to document overall patterns of traumatic occupational fatalities and to identify high risk industries and occupations where

prevention programs are needed.

The present findings suggest that death certificates perform fairly well in meeting the second objective. Death certificates captured 88% of the identified fatalities. Thus, surveillance based on death certificates alone would only underestimate the total number of fatal occupational injuries by approximately 12%. It should be stressed, however, that death certificates do not provide for timely identification of fatalities for investigative follow-up. In Massachusetts, death certificates are not computerized at the Public Health Department until, in the best of circumstances, three to seven weeks after the date of death, often longer. Also death certificates are limited by the fact that they capture "usual" occupation rather than occupation at the time of injury. For purposes of surveillance of occupational disease with long latency, this is appropriate. For traumatic occupational fatalities, however, the latter is obviously more relevant. In the present analysis, there were only three cases in which telephone follow-up of ambiguous information revealed the occupation-at-injury was quite different from usual occupation reported on the death certificate.

DIA reports of fatal injury, when filed within the mandated time frame of 5 days, can provide useful information for investigative follow-up. The finding that DIA records identified less than 65% of the traumatic occupational fatalities during the study period indicates that these data alone, are of limited use for statistical surveillance purposes. It should be noted, however, that a new Workers' Compensation system went into effect in Massachusetts on November 1, 1986 and that the DIA data used in this investigation were collected during the first year subsequent to a change in injury reporting requirements. The incompleteness of the DIA data likely reflects, to some extent, difficulties in shifting to the new system and may be expected to improve with time. The finding that less than 50% of employers failed to file First Reports of Injuries with the DIA for reportable deaths heavily underscores the need for increased education of employers regarding reporting requirements and increased enforcement of these requirements.

OSHA Catastrophe reports, while not an adequate source of statistical information, if filed within the mandated time frame, do allow for timely follow-up investigations. As shown in the present analysis, however, there are substantial gaps in this system. In states like Massachusetts where there are no state OSHA Plans, public employees are excluded from

protection under the Occupational Safety and Health Act of 1970. Likewise, self-employed workers, (over 9% of the identified fatalities) are not covered by OSHA. In addition, occupational deaths involving on-the-road motor vehicles, air transport, and homicides are not routinely identified or investigated by OSHA. In the present analysis, approximately 35% (30 of 86) of the fatal occupational injuries involved either: a) hazards which are not addressed by OSHA, or b) workers in categories excluded from protection under the OSHA Act.

Of those fatalities which did come under OSHA jurisdiction, only 69% were identified by the agency. This figure actually overestimates employer compliance with OSHA fatality reporting requirements because it counts reports filed by others such as police. In a New Jersey study, only 63% of employers interviewed recorded fatalities in their OSHA logs as required.[18] New Jersey reported "that ignorance or carelessness rather than willful intent accounted for the failing of many companies to follow OSHA's record keeping requirements." The observed lack of compliance with OSHA fatality reporting requirements, most notably by employers in the service, retail and construction industries, emphasizes the need for increased OSHA outreach to the non-manufacturing sector and increased enforcement of reporting requirements.

CONCLUSION

Massachusetts should establish a comprehensive occupational fatality surveillance system to provide the timely, accurate, and complete information necessary to prevent fatal occupational injuries:

Recommendation #1: Mandatory reporting of traumatic occupational deaths by all Massachusetts employers to the Massachusetts Department of Labor and Industries which will conduct follow-up worksite investigations as appropriate.

Rationale: Currently there is no comprehensive source of timely information about work-related deaths which can initiate immediate worksite investigations. Implementing this recommendation will centralize timely fatality reports from both the public and private sectors in the state agency responsible for workplace intervention.

Recommendation #2: Direct liaison between medical examiners, and the Department of Labor and Industries and the Occupational Safety and Health Administration.

Rationale: Medical examiners, who are called in to certify and investigate traumatic deaths, can serve an important supplemental role in identifying and reporting work-related deaths. This is particularly important given evidence of poor compliance by employers with reporting requirements. Implementing this recommendation will increase identification of traumatic occupational deaths by the state and federal agencies responsible for investigating these deaths and will foster the necessary exchange between medical examiners and safety experts.

Recommendation #3: Periodic analyses by the Massachusetts Department of Public Health linking death certificates with Department of Labor and Industries, Department of Industrial Accidents, and Occupational Safety and Health Administration records on traumatic occupational deaths to monitor occupational fatality trends and compliance with legally mandated reporting requirements.

Rationale: Implementing this recommendation would ensure that analyses of traumatic occupational deaths similar to that underlying this report would occur on a regular basis, that over-time trends and patterns in deaths would be evaluated, and that employer compliance with reporting laws would be monitored.

Recommendation #4: Use of the findings in this and future occupational fatality reports by government agencies, employers, unions and others to target preventive education programs for employers and workers as well as regulatory activities.

Rationale: The collection and analysis of information about work-related fatalities becomes meaningful only when it is used to guide prevention activities. The present report highlights injuries in the construction industry and electrocutions as priorities. The large number of work-related motor vehicle deaths suggests the need for increased involvement by

occupational safety experts and agencies in establishing protections for vehicle occupants. The finding that 10% of the deaths occurred among workers In the public sector underscores the need to extend health and safety protections to public workers in Massachusetts.

REFERENCES

1. U.S. Department of Labor, Bureau of Labor Statistics: Occupational Injuries and Illnesses in the U.S. by Industry, 1985. Washington, D.C.

2. National Safety Council. Accident Facts, 1985.

3. National Institute for Occupational Safety and Health, Division of Safety Research: Traumatic occupational fatalities 1980–1985. Morgantown, W.V, 1988.

4. Massachusetts Senate Committee on Post Audit and Oversight: The Department of Labor and Industries: A performance audit. Boston, MA, June 1988.

5. 452 CMR 1:03

6. 29 CFR 1904.8

7. U.S. Department of Commerce, Bureau of Census: Alphabetical Index of Industries and Occupations, 1980. U.S. Government Printing Office, Washington, D.C. 20402

8. U.S. Department of Labor, Bureau of Labor Statistics. Geographic profile of employment and unemployment, 1987. April 1988. U.S. Govt. Printing Office, Washington DC.

9. Occupational Safety and Health Administration: Integrated Management Information System, Forms Manual, Chapter 11, ADM 1–1.12A. April 1984.

10. Anderka M, Gallagher SS, Azzara CA: Adolescent Work–Related Injuries. Presented at the American Public Health Association Annual Meeting, Washington, D.C., 1985.

11. Davis M, Rowland A: Problems faced by minority workers. In Levy BS, Wegman DH (eds): "Occupational Health." Boston: Little, Brown, 1983.

12. Robinson J: Trends in Racial Inequality and Exposure to Work–Related Hazards, 1968–1986. AAOH J 37: 56–63, 1989.

13. 454 CMR 10:00

14. Cone JE et al: Fatal Occupational Injuries In California, 1983. Presented at the American Public Health Association Annual Meeting, Boston, 1988.

15. Baker, SP et al: Fatal Occupational Injuries, JAMA 248: 692–697, 1982.

16. U.S. Department of Transportation, National Highway and Traffic Safety Administration: Fatal Accident Reporting System, 1987. DOT HS 807 360 Dec. 1988.

17. Massachusetts Department of Public Health, Division of Health Statistics and Research: Selected Demographic and Health Characteristics: A Comparison of Massachusetts and the United States, 1940–1985. October, 1987.

18. Stanbury M et al: Traumatic Occupational Fatalities in New Jersey, Appendix C in "Counting Injuries and Illnesses in the Workplace," National Academy of Sciences, 141–150, 1988.

Table 1

OCCUPATIONAL FATALITY INFORMATION SOURCES

Information Source/Agency	Reporting Requirements	Major Exclusions
Death certificates/DPH	Medical examiners who investigate and certify traumatic deaths are required to complete the death certificate and to record if the injury occurred at work. (M.G.L. c.46 ss.1,9)	None
Workers' Compensation Records*/DIA	Employers covered by the Massachusetts Workers' Compensation Act are required to report any death resulting from an injury sustained by an employee to the DIA within 5 days of the 5th lost workday. (452 CMR 1:03)	Federal workers, firefighters, police, railroad & harbor workers, longshoremen, self-employed
Fatality records/ DL&I	Employers involved in the construction of any tunnel or shaft are required to report fatalities to the DL&I within 48 hours of the death. (454 CMR 5:12)** DL&I also maintains records of fatalities voluntarily reported to the Department by employers, workers, unions, police, etc.	N/A
Fatality reports/OSHA	Employers covered by federal OSHA are required to report any accident resulting in fatality to OSHA within 48 hours of the accident. (29 CFR 1904.8)	Public employees, household workers, mine workers, railroad workers, self-employed

** Workers' Compensation records include: First Reports of Injury filed by employers, claims filed by employees, and payment and denial of payment records filed by insurers.*

*** In 1988, the Tunnel Safety Regulations were superceded by the Construction Industry Rules and Regulations (454 CMR 10:00), which require all employers in the construction industry to report all accidents resulting in death or hospital confinement to the DL&I immediately. Written notification is required to be mailed to DL&I no later than the start of the second workday after the incident occurred.*

Table 2

Traumatic Occupational Fatalities
by Age, Sex, and Race
Massachusetts, November 1986 - October 1987

Age	M	F	White	Black	Others	Unspec.	Total	Rate per 100,000
16-19	4	0	4	0	0	0	4	-
20-34	35	0	31	4	0	0	35	2.9
35-54	30	2	28	1	3	0	32	2.8
55-64	10	1	10	0	1	0	11	3.4
65 +	2	0	2	0	0	0	2	-
Unspec.	1	1	0	0	0	2	2	-
TOTAL	82	4	75	5	4	2	86	2.9
Rate per 100000	5.2	-	2.6	4.9	-	-	2.9	

- Rate not computed due to small numbers.

Table 3

Traumatic Occupational Fatalities
by Place of Occurrence
Massachusetts, November 1986 - October 1987

Place of Occurrence	No.	%
Construction Site	10	11.6
Street/Highway/Sidewalk	25	29.1
Buildings (and their premises):		
Industrial Worksite/Factory	13	15.1
Other Commercial Buildings and Premises	17	19.8
Public Building	1	1.2
Private Dwellings	4	4.7
Unspecified Buildings and Premises	7	8.1
Wooded Area/Open Seas/Mountainside	4	4.7
Unspecified Location	5	5.8
TOTAL	86	100.0

Table 4

Traumatic Occupational Fatalities
by Time of Injury
Massachusetts, November 1986 - October 1987

Time	No.	%
9am - 1pm	24	27.9
1pm - 5pm	22	25.6
5pm - 9pm	5	5.8
9pm - 1am	4	4.7
1am - 5am	7	8.1
5am - 9am	11	12.8
Time unspecified	13	15.1
TOTAL	86	100.0

Table 5

Traumatic Occupational Fatalities
by Time Interval Between Injury and Death*
Massachusetts, November 1986 - October 1987

Time Interval (hours/days)	No.	%
< 1 hour	50	58.1
1 - 4	14	16.3
4 - 24	4	4.7
1 -7 days	6	7.0
7 - 30	3	3.5
≥ 30	2	2.3
Unknown	7	8.1
TOTAL	86	100.0

*As recorded on death certificates.

Table 6

Traumatic Occupational Fatalities
by Cause of Death
Massachusetts, November 1986 - October 1987

ICD9 E-Codes	Cause	No.	%
E810 - E819	Motor Vehicle Traffic (Road) accidents	19	22.1
E820 - E825	Motor Vehicle Non-traffic Accidents	2	2.3
E840 - E845	Air & Space Transport Accidents	5	5.8
E850 - E869	Accidental Poisoning by Solid, Liquid or Gaseous Substances	2	2.3
E880 - E888	Accidental Falls	13	15.1
E890 - E899	Accidents Caused by Fires and Flames	2	2.3
E910 - E915	Accidents Caused by Submersion, Suffocation, and Foreign Bodies	4	4.7
E916	Struck by Falling Objects	5	5.8
E918	Caught Accidentally In or Between Objects	3	3.5
E919	Accidents Caused by Machinery	10	11.6
E920	Accidents Caused by Cutting/ Piercing Instrument/Object	1	1.2
E925	Accidents Caused by Electric Current	16	18.6
E960 - E969	Homicides	3	3.5
E928	Other Unspecified and Accidental/ Environmental Causes	1	1.2
TOTAL		86	100.0

Table 7

Traumatic Occupational Fatalities
by Industry
Massachusetts, November 1986 - October 1987

Industry	Fatalities	Rate per 100,000
Agriculture, Forestry & Fishing	3	-
Mining	0	-
Construction	27	17.8
Manufacturing	11	1.8
Transportation, Communications & Other Utilities	13	7.8
Wholesale Trade	2	-
Retail Trade	11	2.0
Finance, Insurance & Real Estate	0	-
Services	11	1.1
Public Administration	4	3.0
Military	1	-
Unspecified	3	-
TOTAL	86	2.9

- Rate not computed due to small numbers.

Table 8

Traumatic Occupational Fatalities by Occupation
Massachusetts, November 1986 - October 1987

Occupation	Fatalities	Rate per 100,000
Managerial & Professional Specialty :		
Exec/Admin/Mgr	3	-
Prof. Specialty	2	-
Technical, Sales & Administrative Support :		
Technicians & Related Support	7	6.2
Sales	7	2.1
Administrative Support (incl. clerical)	0	-
Service Occupations	9	2.5
Precision Production, Crafts & Repair	25	7.1
Operators, Fabricators & Laborers :		
Machine Operators, Assemblers, Inspectors	4	1.8
Transportation & Material Moving	16	18.0
Handlers, Equipment Cleaners, Helpers & Laborers	9	9.3
Farming, Forestry & Fishing Occupations	2	-
Military	1	-
Unspecified	1	-
TOTAL	86	2.9

- Rate not computed due to small numbers.

Table 9

Traumatic Occupational Fatalities
in the Public and Private Sectors
Massachusetts, November 1986 - October 1987

	Fatalities	Rate per 100,000
Public Sector	9	2.3
Private Sector	77	2.9
TOTAL	86	2.9

Table 10

Number and Percent of Traumatic Occupational Fatalities
by Information Source
Massachusetts, November 1986 - October 1987

Information Source	No.	%
Death certificates	76	88.4%
DIA	53	61.6%
DL&I	19	22.1%
OSHA	35	40.6%
Death certificates and/or DIA	84	97.6%
Death certificates and/or DL&I	78	90.7%
Death certificates and/or OSHA	76	88.4%
Death certificates only, no other source	24	27.9%
DIA only, no other source	15	17.4%
DL&I only, no other source	2	2.3%
OSHA only, no other source	0	-

Table 11

Traumatic Occupational Fatalities
by Information Source and Major Cause of Death
Massachusetts, November 1986 - October 1987

Causes of Death	# Fatalities	Death Certs	Captured by DIA	DLI	OSHA
Motor vehicle traffic accidents	19	14	12	0	0
Falls	13	13	9	2	8
Machinery	10	10	8	4	9
Electrocutions	16	16	9	5	10
Others	28	23	15	8	8
TOTAL	86	76	53	19	35

Table 12

Traumatic Occupational Fatalities
by Information Source & Industry
Massachusetts November 1986 - October 1987

Industry	# Fatalities	Captured by : Death Certs	DIA	DLI	OSHA
Agriculture, Forestry & Fisheries	3	2	3	0	0
Construction	27	25	18	9	17
Manufacturing	11	9	11	5	9
Transportation, Communications & Other Public Util.	13	11	7	4	4
Wholesale Trade	2	2	1	0	1
Retail Trade	11	10	5	0	2
Finance, Insurance & Real Estate	0	0	0	0	0
Services	11	9	7	1	2
Public Admin.	4	4	1	0	0
Military	1	1	0	0	0
Unspecified	3	3	0	0	0
TOTAL	86	76	53	19	35

Table 13

Traumatic Occupational Fatalities
by Information Source and Occupation
Massachsuetts November 1986 - October 1987

Occupation	# Fatalities	Captured by : Death Certs	DIA	DLI	OSHA
Exec/Admin/Mgr	3	2	3	1	1
Professional Specialty	2	2	2	0	1
Technicians & Related Support	7	4	4	2	1
Sales	7	6	3	0	1
Services	9	8	4	0	1
Farming, Forestry & Fisheries	2	2	0	0	1
Precision Production, Craft & Repair	25	22	17	8	13
Machine Operators, Assemblers & Inspectors	4	4	4	3	4
Transportation & Material Moving	16	15	9	3	5
Handlers, Eqpt. Cleaners, Helpers & Laborers	9	9	7	2	7
Military	1	1	0	0	0
Unspecified	1	1	0	0	0
TOTAL	86	76	53	19	35

Table 14

Reportable Traumatic Occupational Fatalities
Reported to DIA and OSHA
By Major Cause of Death
Massachusetts, November 1986 - October 1987

	DIA		OSHA	
Cause	Reportable Fatalities	Fatalities Reported	Reportable Fatalities	Fatalities Reported*
Motor Vehicle Traffic Accidents	12	8	3	0
Falls	10	5	11	8
Machinery	9	5	10	9
Electrocutions	10	3	13	10
Others	17	5	14	8
TOTAL	58	26	51	35

* Numbers overestimate employer compliance with OSHA fatality reporting requirements because they include deaths reported by others such as police.

Table 15

Reportable Traumatic Occupational Fatalities
Reported to DIA and OSHA by Industry
Massachusetts, November 1986 - October 1987

	DIA		OSHA	
	Reportable Fatalities	Fatalities Reported	Reportable Fatalities	Fatalities Reported*
Fatalities by Industry				
Agriculture, Forestry & Fisheries	2	1	1	0
Construction	18	8	22	17
Manufacturing	10	8	9	9
Transportation, Communications & Other Public Util.	8	3	4	4
Wholesale Trade	2	0	2	1
Retail Trade	8	3	6	2
Services	8	3	7	2
Public Admin.	2	0	0	0
Military	0	0	0	0
Unspecified	0	0	0	0
TOTAL	58	26	51	35

*Numbers overestimate employer compliance with OSHA fatality reporting requirements because they include deaths reported by others such as police.

Table 16

Reportable Traumatic Occupational Fatalities
Reported to DIA and OSHA by Occupation
Massachusetts, November 1986 - October 1987

	DIA		OSHA	
	Reportable Fatalities	Fatalities Reported	Reportable Fatalities	Fatalities Reported*
Fatalities by Occupation				
Exec/Admin/Mgr.	3	0	2	1
Professional Specialty	1	0	2	1
Technicians & Related Support	3	3	1	1
Sales	3	1	2	1
Services	7	4	6	1
Farming, Forestry & Fisheries	2	0	1	1
Precision Production, Craft & Repair	17	9	17	13
Machine Operators Assemblers & Operators	4	3	4	4
Transportation & Material Moving	10	5	6	5
Handlers, Eppt. Cleaners, Helpers & Laborers	7	1	9	7
Military	0	0	0	0
Unspecified	1	0	1	0
TOTAL	58	26	51	35

*Numbers overestimate employer compliance with OSHA fatality reporting requirements because they include deaths reported by others such as police

Appendix A

DATA ITEMS OBTAINED FROM THE FOUR DATA SOURCES

Death Certificates

- Name of deceased
- Social security number
- Sex
- Race
- Address
- Data of birth
- Date of injury
- Date of death
- Interval between injury and time pronounced dead
- Usual occupation
- Usual industry
- Usual occupation and industry codes (Bureau of Census)
- Place of injury
- Location (address) of event
- County of death
- Description of event
- Cause of death
- Internal Classification of Disease 9 codes for underlying and mentioned causes

DIA Records

- Name of deceased
- Address
- Sex
- Regular occupation
- Occupation at injury
- Name of employer
- Address of employer
- Kind of business
- Date of injury
- Date of death
- Injury address
- Description of event

DL&I Records

- Name of deceased
- Address
- Sex
- Regular occupation
- Occupation at injury
- Name of employer
- Address of employer
- Kind of business
- Date of injury
- Date of death
- Description of event

OSHA Reports

- Date of injury
- Number of fatalities
- Location of event
- Type of event
- Name of employer
- Type of ownership
- Number of Employees
- Standard Industrial Classification (SIC) code
- Industrial Code
- Description of event
- Date of investigation (if investigated)
- Type of investigation (if investigated)

Appendix B

DISTRIBUTION OF ALL FATALITIES, BOTH ELIGIBLE AND INELIGIBLE, IDENTIFIED BY THE FOUR DATA SOURCES COMBINED

Work-related physical trauma and poisonings (excluding traffic* accidents & suicides	62
Traffic* accidents on the job	24
Injury occurred outside of Massachusetts	12
Traffic* accidents to or from work	3
Cardiovascular deaths	52
Cerebrovascular deaths	2
Aneurysm	2
Other chronic diseases	4
Suicides	6
Other ineligible conditions	6
Indeterminate	1
	174

*(Includes land, air or water craft accidents)

APPENDIX C

Traumatic Occupational Fatalities by Cause of Death and Industry or Occupation Massachusetts, November 1986 - October 1987

Cause of Death Codes (for Tables A & B):

Code	Cause of Death
1	Motor Vehicle Traffic Accidents
2	Motor Vehicle Nontraffic Accidents
3	Air and Space Transport Accidents
4	Accidental Poisoning by Drugs, Medications & Biologicals
5	Accidental Poisoning by Solid and Liquid Substances, Gases & Vapors
6	Accidental Falls
7	Accidents Caused by Fires and Flames
8	Accidents Caused by Submersion, Suffocation & Foreign Bodies
9	Struck by Falling Objects
10	Caught Accidentally In or Between Objects
11	Accidents Caused by Machinery
12	Accidents Caused by Cutting or Piercing Objects or Instruments
13	Accidents Caused by Electric Current
14	Other Unspecified and Accidental/Environmental Causes
15	Homicides

Table A

Number of Fatalities by
Cause of Death and Industry

	Cause of Death Code														
Industry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agriculture, Forestry & Fisheries	1		1			1									
Construction	2	1	1			8		2	3	1	2	1	6		
Manufacturing	2	1				1				1	4		2		
Transp., Comm., & Public Util.	6		1	1						1	2		2		
Wholesale Trade													2		
Retail Trade	2					2		2	1		1			1	2
Business & Repair Services	4				1		1		1		1		3		
Public Administration	1					1	1								1
Military													1		
Unspecified	1		2												

Table B

Number of Fatalities by
Cause of Death and Occupation

Occupation	Cause of Death 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Exec/Admin/Mgr.	1										2				
Professional Specialty						1					1				
Technicians & Related Support	2		4										1		
Sales	2		1					1	1					1	1
Services	1					2	2	1					1		2
Farming, Forestry & Fisheries						1					1				
Precision Prod., Crafts & Repairs	2	1		1	1	5		1	3	2	1		8		
Machine Operators, Assemblers & Inspectors										1	3				
Transportation & Material Moving	11					1		1			2		1		
Handlers, Eqpmt Cleaners, Helpers & Laborers		1				3			1			1	3		
Military													1		
Unspecified													1		